II. "On the Lightning Spectrum." By Lieut. JOHN HERSCHEL, R.E. Communicated by Prof. STOKES. Received August 8, 1868.

I have had two or three opportunities of seeing this spectrum to advantage of late. The storms at the period of the setting in of the south-west monsoon here are very frequent, and supply for a time almost incessant flashes, many of which are of course very brilliant. The first time I examined the light in the spectroscope I had no idea of measuring, but was content to realize the principal facts of a continuous spectrum crossed by bright lines; but subsequently I made several attempts (with some success) to obtain measures. That I was unable to do more in this line is due partly to the difficulty of utilizing the short-lived appearance, partly to that fascination of waiting for "one more" bright flash to verify the intersection, which can only be thoroughly appreciated by the aid of a similar experience.

The principal features of the spectrum are a more or less bright continuous spectrum crossed by numerous bright lines, so numerous indeed as to perplex one as to their identity. This perplexity is increased by the constantly changing appearance due to a variable illuminating power. This variable character of the appearances is unquestionably the peculiar feature of the spectrum. It is not that the whole spectrum varies in brightness in the same degree, but that the *relative* intensities are variable, not only among the various lines, but between these and the continuous spectrum. The latter is sometimes very brilliant; and when that is the case, the red portion is very striking, though in general the spectrum seems to end abruptly at D+0·34 (E=D+1·38, Kirchhoff's 120·7=D+0·55).

There is one principal line which I found equal to D+2·20 as the result of five independent measures. The probable error of this value is about ±·02. The general mean of all my measures of the principal *nebular* line (obtained from twelve different nebulæ) is 2·18, with a probable error of about ±·02. I have therefore very little doubt that these are the same, viz. the nitrogen line identified in the case of nebulæ by Mr. Huggins. This line in the lightning spectrum is narrow and sharply defined, and is conspicuously the brightest, except as noted below.

The next in prominence is situated about D+3·58 (F=D+2·73, Kirchhoff's 232·5=D+3·50). It is broader and less vivid, and not so well defined at the edges.

There are several other conspicuous lines, but none comparable to the first. I noticed a sharp line in the red, but did not get a measure.

I said that at D+0·34 the continuous spectrum ends abruptly. A faint continuation is, however, seen frequently in bright flashes, very bright ones bringing out a brilliant red end crossed by a bright line.

The whole of the ordinary spectrum *seems* green and blue, or rather greenish blue; but as the usual prismatic order of colours is recognizable in bright flashes, it is to be inferred that the region from E to F is so much

brighter as to give the character in question. What strikes one most, however, is the varying relative brightness of the continuous and linear spectra; sometimes the lines are scarcely seen, and sometimes very little else is seen. This may be nothing more than an illusion; but in the absence of any certainty that it is so, the impression left on the mind is worth recording.

The difficulty of discriminating between the many less prominent lines is immensely increased by the momentary character of the phenomenon. Before the mind has selected an individual, the feeble impression on the retina has vanished; and before another flash succeeds, the memory of the half-formed choice has vanished with it, and there is nothing on which to found a selection. Otherwise it would be easy enough to measure many more lines.

III. "Products of the Destructive Distillation of the Sulphobenzolates. —No. II." By JOHN STENHOUSE, LL.D., F.R.S., &c. Received September 8, 1868.

In a paper published by me in the Proceedings of the Royal Society, 1865, I described the manner of preparing sulphobenzolate of sodium and the products of its destructive distillation in a copper retort. These were chiefly sulphide of phenyl and a crystalline substance, of which too small a quantity was obtained to enable me properly to examine it.

As I wished to procure these products in larger quantities, instead of employing small copper retorts, which were rapidly destroyed, I conducted the operation in tolerably large cast-iron ones heated in a gas-furnace, and found that they were not sensibly corroded even after a great number of distillations. The quantity of sodium-salt decomposed in each distillation was about 200 grammes.

The oily products obtained by this process, after separation from the supernatant watery layer, were introduced into a copper retort having a bent glass tube luted into the neck and redistilled, the retort being heated to redness towards the close of the operation. In this way a considerable amount of impurity was removed. The bright yellow-coloured oil was then rectified in a glass retort. It began to boil at 80° C., and rose rapidly to 165° C., between which and 180° C. about one-fourth of the liquid came over. The temperature then again rose rapidly to 290° C., and from 290° to 300° a large quantity of nearly pure sulphide of phenyl distilled. The small quantity of dark-coloured residue in the retort was poured into a beaker, where it became semisolid on cooling from the deposition of the crystalline substance I have before mentioned*.

Phenyl-Mercaptan.

The portion boiling between 165° C. and 180° C., on being repeatedly rec-

* Proc. Roy. Soc. vol. xiv. p. 353.